AcquiSuite®

USB Modem Addendum

Applies to: A8812 AcquiSuite, A8810 AcquiSuite EMB, A7810 AcquiLite

Date Nov 30, 2011

Copyright Information

Limited Warranty

⚠ DANGER ⚠ ⚡
Hazard of Electric Shock, Explosion or Arc Flash
● Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes. ● This equipment must only be installed and serviced by qualified electrical personnel. ● Read, understand and follow the instructions before installing this product. ● Turn off all power supplying equipment before working on or inside the equipment. Use properly rated voltage sensing device to confirm power is off.   DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION ● Only install this product on insulated conductors. Failure to follow these instructions will result in death or serious injury.

NOTICE
● This product is not intended for life safety applications. ● Do not install this product in hazardous or classified locations. ● The installer is responsible for conformance to all applicable codes.

FCC Part 15 Information

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Introduction

Beginning with AcquiSuite firmware version v02.11.1106b, the AcquiSuite Data Acquisition Servers (DAS) support the following *optional* USB modems:

- **USRobotics USR5637 -- V.92 "POTS"* modem**

- **Radicom-V92HU-E2 -- V.92 "POTS" modem**

- **TrendNet TFM-561U – V.92 "POTS" modem (a clone of the Radicom V92HU-E2)**

- **MultiTech MTCBA-G-U-F4 – GPRS/GSM cellular modem**

* "POTS" = Plain Ol' Telephone System, aka Landline

Features

- No modem drivers required.

- USB hot-plugging fully supported.

- *Clear* and *immediate* feedback is shown on the LCD of the AcquiSuite/AcquiLite during each phase of Dial-Out, Dial-In and Data-Upload to speed installation and debugging.

- **Installation and initial setup requires a Web Browser**, but basic diagnostics are available on the LCD.

- "POTS" modems support Dial-In and Dial-Out.

- Cellular modems support Dial-Out only.

Planning the Installation of a "POTS" Modem

To install a USB "POTS" modem, you will typically need the following:

1. [__] The modem itself;

2. [__] The modem's documentation and drivers CD, in case you need to install the modem on a PC to verify proper operation;

3. [__] RJ11 telephone cord of sufficient length;

4. [__] USB extension cable if the modem cannot be plugged directly into the AcquiSuite/AcquiLite DAS's USB port. *Note that all of the USB "POTS" modems have USB "type-A" male plugs, so the necessary extension cable would be a USB "type-A" male to "type-A" female.*

5. [__] A PC (or other device with a full-featured web browser) to be used to configure the modem via the AcquiSuite/AcquiLite DAS's web user-interface.

6. [__] An Ethernet cross-over cable to connect said PC to the DAS's ethernet port.

7. If the DAS is going to be dialing out, you'll need:

   1. [__] The telephone number of the PPP server the DAS will be dialing into;

   2. [__] Any special dial-prefixes to get an outside line (e.g., "dial 9");

   3. [__] The PPP username and PPP password the DAS will use to log into the PPP server.

8. If the DAS will be receiving dial-in calls, you'll need:

   1. [__] The contact information of the person who can trigger such a dial-in call while you are at the site, to allow testing of the dial-in configuration;

   2. [__] The phone number assigned to the telephone line the DAS will use to receive calls, in case you need the assistance of Obvius Tech Support.

Planning the Installation of the Multitech GPRS/GSM Cellular Modem

To install the Multitech GPRS/GSM cellular modem, you will typically need the following:

1. [__] The modem itself;

2. [__] The modem's documentation and drivers CD, in case you need to install the modem on your PC to verify proper operation;

3. [__] USB cable to connect the modem to the AcquiSuite/AcquiLite DAS's USB port. *Note that all of the USB cellular modems mentioned in this document have USB "type-B" male plugs, so the necessary extension cable would be a USB "type-A" male to "type-B" male.*

4. [__] A PC (or other device with a full-featured web-browser) to be used to configure the modem via the AcquiSuite/AcquiLite DAS's web user-interface.

5. [__] An Ethernet cross-over cable to connect said PC to the DAS's ethernet port.

6. [__] For GSM/GPRS modems, an ***appropriate* SIM card, *activated* for the modem**.

   1. *Note: SIM cards from personal cell phones may not work with data-only cellular modems. Ask your cellular carrier about a data-plan account which is compatible with the specific Multitech Modem you plan to use.*

   2. ***Obvius strongly recommends that you verify the combination of the modem and SIM card are activated and working properly before heading out to the field.***

7. [__] Check that your data-plan limits match your intended usage with the DAS to avoid overage charges.

   1. *Note: Obvius recommends an unlimited data-plan.*

   2. ***Choosing an appropriate plan is your responsibility. Obvius is not responsible for any overage fees or penalties that result from choosing an insufficient data-plan.***

8. [__] The carrier-specific Modem Setup (if any) string needed to initialize the modem.

9. [__] The carrier-specific Access Point Name (APN), Account username and Account password.

10. [__] Proper mounting hardware (screws, etc.) to mount the modem with the antenna positioned for optimal signal strength.

Comparing "POTS" Modems

The 3 new POTS modems are pictured on the next page, with close-ups on the following pages.

Compared to the built-in modems of the AcquiSuite A8812, these USB modems each lack speakers and each have a different set of status LEDs (or in the case of the Radicom have no speaker and NO LEDs.)

To compensate for this lack, the AcquiSuite and AcquiLite DAS displays status messages on its 2x16 LCD display during all phases of:

- Hot-plugging,
- Dial-in,
- Dial-out,
- Data uploading.

Examples of the LCD messages are given later in this document.

Illustration 1: Comparing "POTS" modems: USRobotics, TrendNET, Radicom

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The USRobotics USR5637

- Power LED – on when modem is receiving power from the USB port.

- Data LED – blinks when modem is connected and transferring data to the remote modem.

- No speaker

The Radicom-V92HU-E2

- No LEDs whatsoever.

- No speaker.
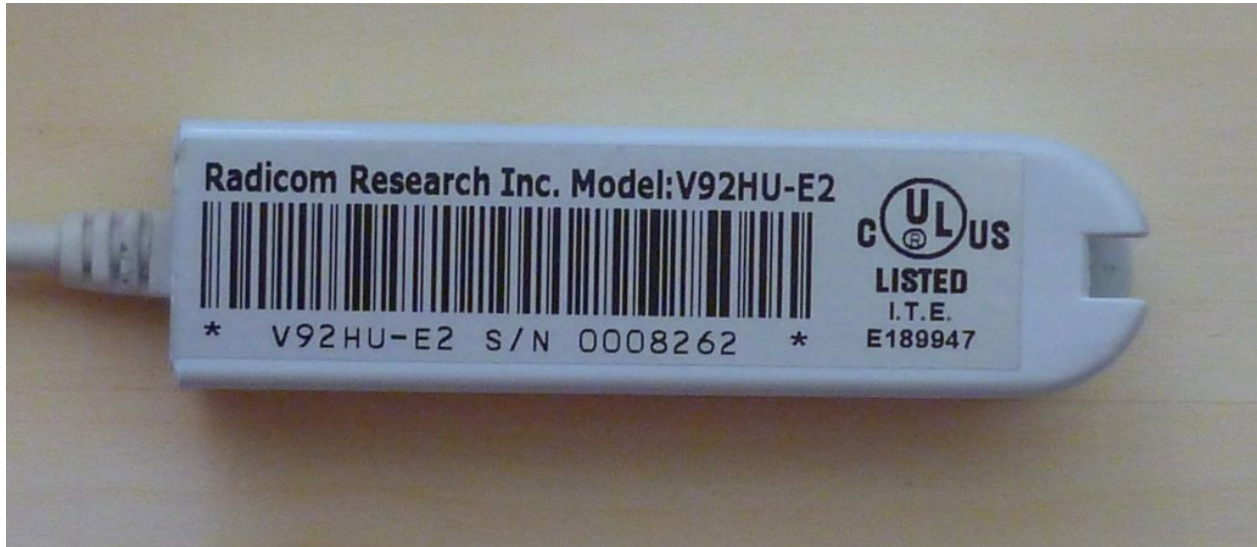
The TrendNET TFM-561U

- A "clone" of the Radicom-V92HU-E2, but with LEDs.
- Link LED – on when the modem has "connected" to the remote modem.
- Data LED – blinks when data sent/received to the remote modem.
- No speaker.

The TrendNET TFM-561U
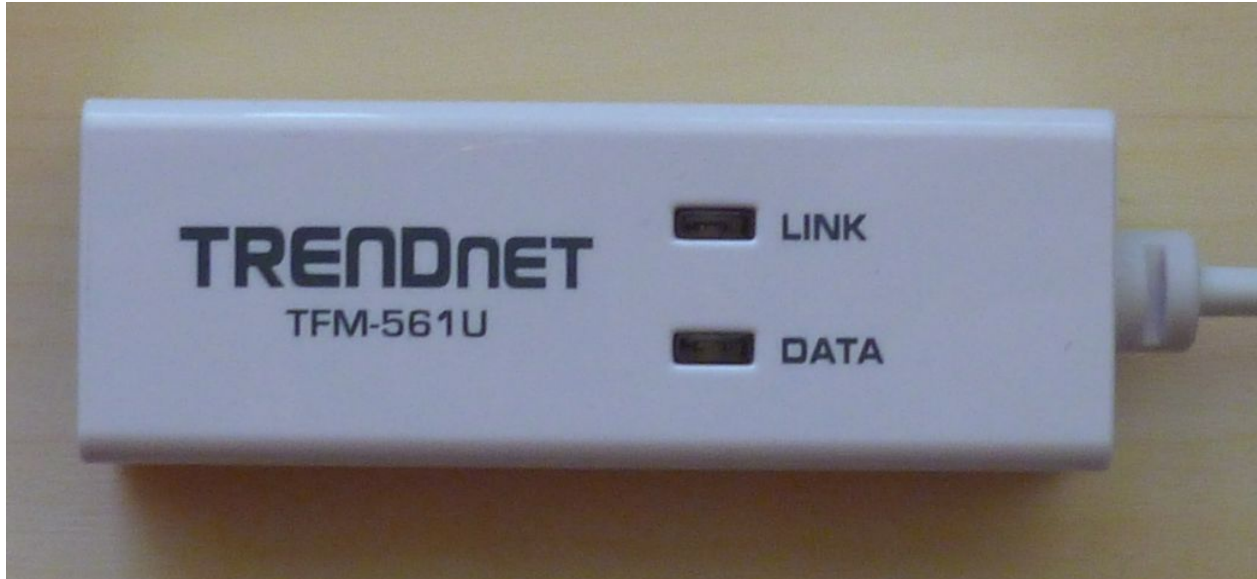
Cellular Modems

In addition to the onboard cellular-modem options of the A8812 model, the AcquiSuite/AcquiLite DAS support the following USB cellular modems:

- **MultiTech MTCBA-G-U-F4 – GPRS/GSM cellular modem**

MultiTech MTCBA-G-U-F4 – USB GRPS cellular modem

This modem is pictured below, showing the mounting bracket provided by Multitech:
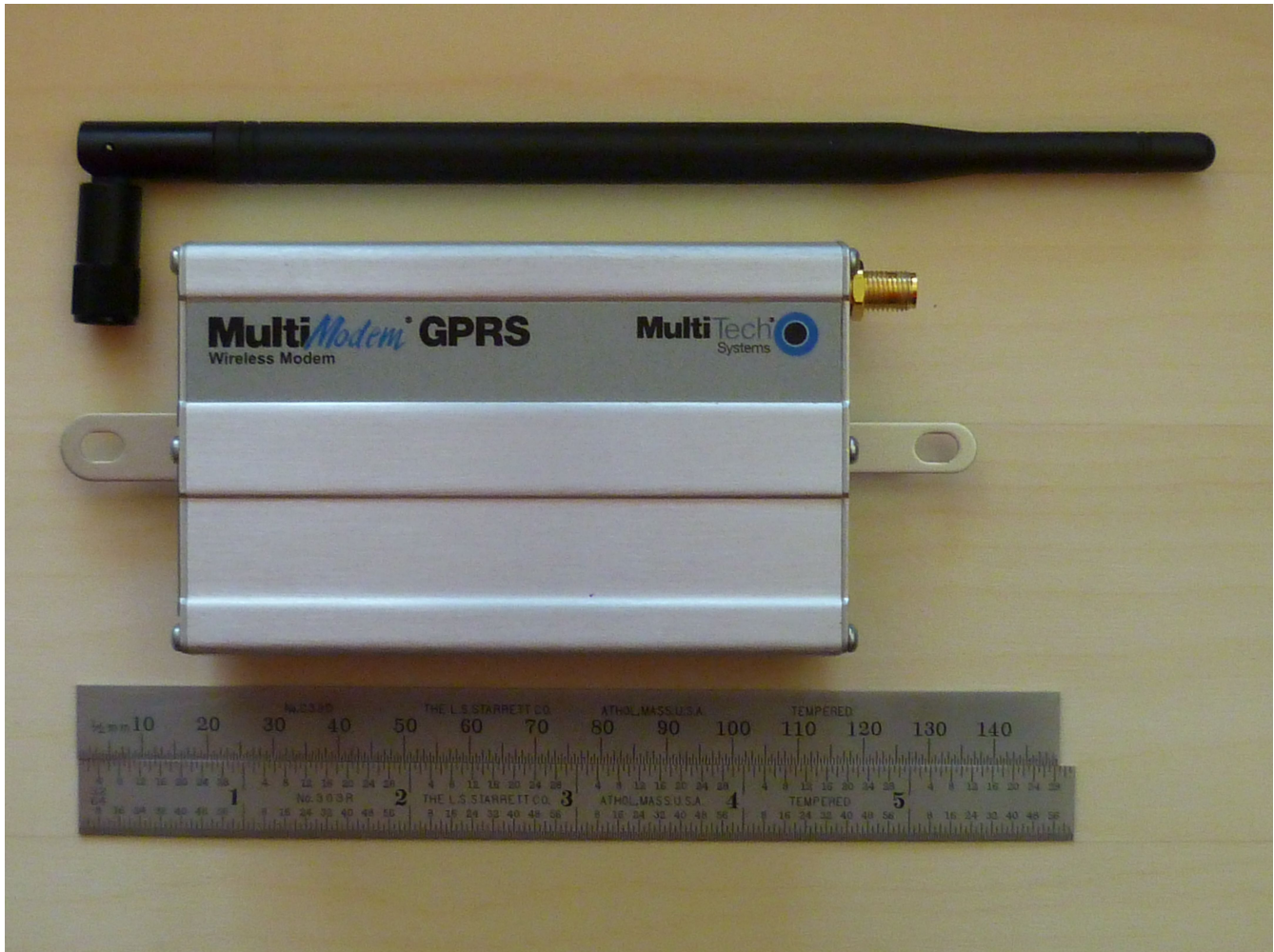
Here is a close-up of the Mulitech's front-panel showing the LEDs and slot for GSM SIM card:

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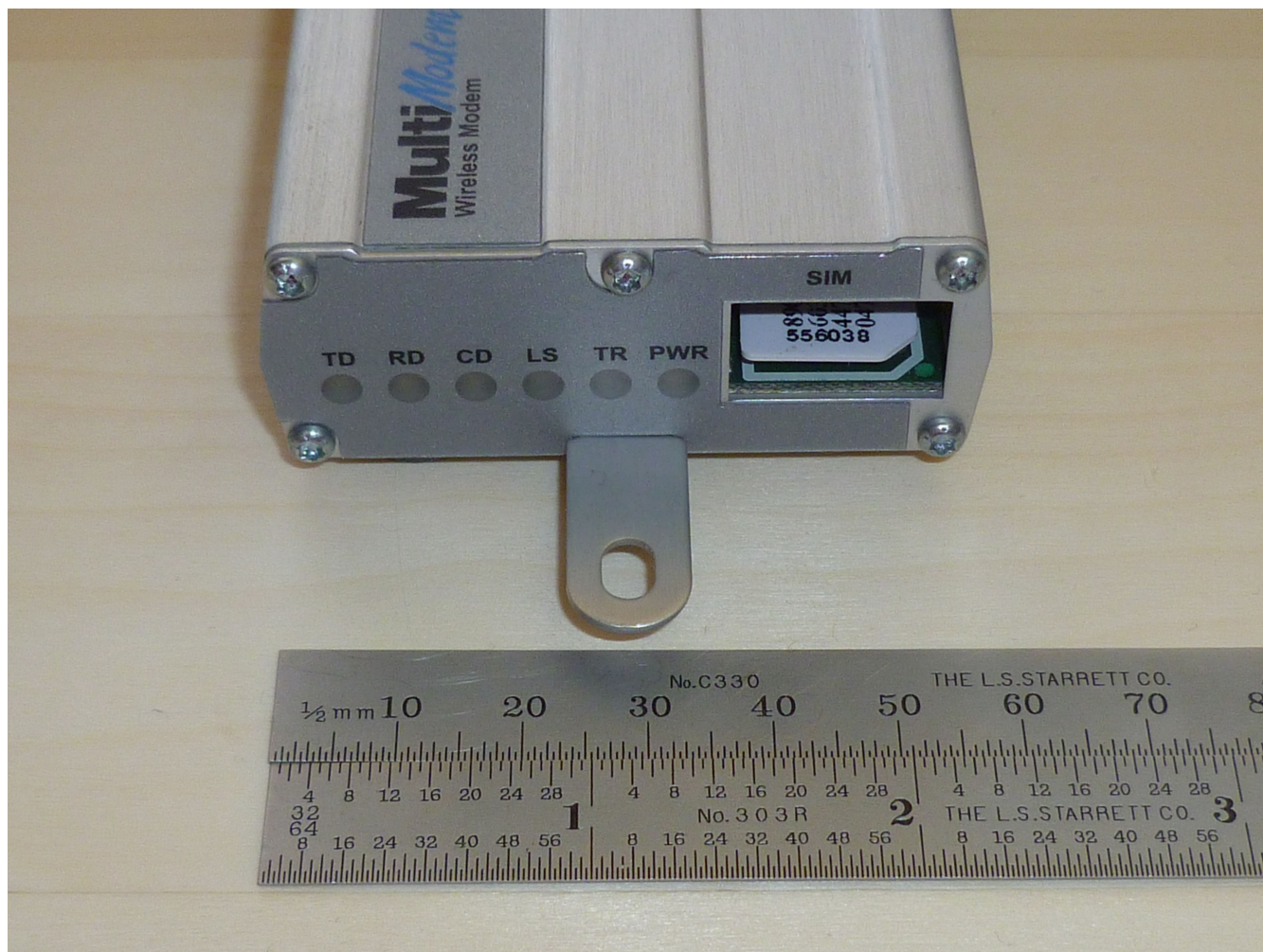
New Features of the AcquiSuite/AcquiLite's LCD

Together with support for USB modems, the LCD console of the AcquiSuite/AcquiLite DAS has several new features to aid in debugging and diagnostics of dial-up connections if a PC and web-browser is not available.

The new LCD behavior is intended to be very intuitive and simple, but for the sake of completeness it is described here.

First, **status events** from the dial-out, dial-in and the data-upload processes will **preempt** the DAS's normal message rotation, unless the user pressed either the MENU or SELECT button in the last 3 seconds, or the user is currently in one of the DAS's LCD menus.

These status messages remain on the LCD for 30 seconds, then (assuming no new status event occurs), the DAS returns to displaying its normal message rotation (e.g. showing its IP address, the timezone and current time, and any errors from Modbus devices).

Examples of these status messages are given later in this document.

Second, at any time the user may **HOLD DOWN the SELECT button to "hold" the display**. Holding SELECT stops the normal LCD message rotation and stops the LCD being preempted by any new status events. **While SELECT is held, the display also scrolls at a slower rate** to allow for easier reading of the LCD message.

Third, the most recent status event (if there is one) will appear in the normal message rotation, and the user can review these messages in the normal way (by pressing SELECT to step through them). Typically, the status message will be either the last modem error, the last upload error or an upload success message.

Installation

Step 1: Plug it in

To begin "installing" a USB modem, plug it into the AcquiSuite or AcquiLite DAS's USB port.

No modem drivers are needed, and the AcquiSuite/AcquiLite DAS fully supports hot-plugging of USB devices.

When the AcquiSuite/AcquiLite DAS detects the modem, it should display a message on its LCD, similar to this:

The actual message may vary a bit because the description ("USB Modem") is loaded from the USB modem itself.

Note: USB Hubs

Obvius recommends against using USB hubs if they can be avoided, as they add another point-of-failure to the system.

Step 2: Configure the Modem

For this and the following steps you must use a PC to browse to the web "user-interface" of the AcquiSuite or AcquiLite DAS. The DAS's current IP address is shown on its LCD, and can be changed via the LCD menu. (Exact details of how to do this are covered in the DAS' Installation Manual.)

To setup the modem, browse to the DAS's "Modem Setup" page, which should appear as follows:

If the **modem type** doesn't match the modem you connected, **press "Scan for New Modem",** confirm that the modem found is correct, and press "Apply". This action tells the AcquiSuite/AcquiLite DAS what modem it should expect to use.

Note: If dial-in or dial-out is enabled but the DAS does not find a modem of the expected type or the modem fails to initialize, the DAS will report this inconsistency as an error on its LCD and in its web administration pages, and continue trying to detect and initialize the modem. If this error condition persists for an entire day (24 hours), the DAS will gracefully reboot itself in a "last-ditch" attempt to fix any possible communication problem with the modem. This should never occur in any normal operation or configuration scenario.

If any special **Modem Setup** string is needed, enter it here and **press "Apply."**

Most "POTS" modems do not require any special setup string.

If the Modem is not found, use "USB Devices" page

If "Scan for New Modem" did not find the modem of the expected type, use the DAS's "USB Devices" page to verify the modem is connected and "seen by" the DAS.

Here is an example of how the Radicom and TrendNET modems appear in the DAS's USB Devices page – unfortunately, the brand and model number on the case is often different than the details available to the DAS via USB.
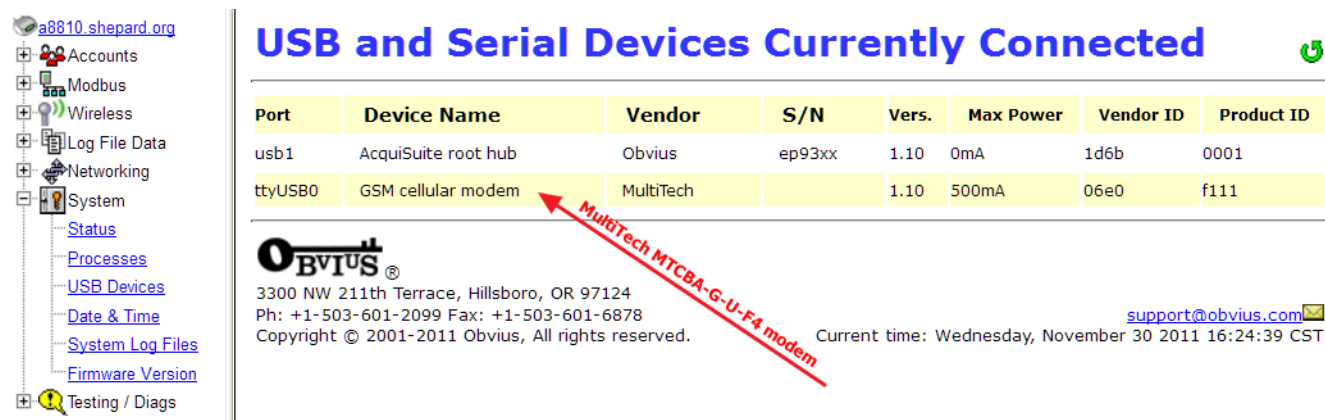
This example shows the MultiTech MTCBA-G-U-F4 GSM/GPRS modem as it appears in the USB Devices page:

If the modem does not appear in "USB Devices", connect the modem to a PC and follow the modem vendor's instructions to verify proper operation.

If the modem appears in the "USB Devices" list, but is not assigned a Port beginning with "ttyUSB..." or "ttyACM...", this means the DAS could not properly initialize the USB modem hardware. Typical reasons for this are:

1. The modem is defective – Connect the modem to a PC to confirm this. *If the modem's vendor provides drivers and support for their modem with a PC operating system such as MacOS or Windows, please attempt to determine if the modem works properly with a PC when following the vendor's instructions.*

2. You are using a USB hub, and possibly other USB devices, and the combination of the hub, other devices and the USB modem exceeds the total power the DAS is able to provide to its USB port.

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Step 3: Enable & Configure Dial-Out

If you wish the DAS to automatically dial-out to upload meter data, you must enable and configure this via the DAS's "Dialout Setup" web page:

Note that the time-of-day that the DAS dials out is configured in the "Log File Data >> Upload/Setup" page. This is described in the Installation Manual for the DAS.

The Dial-Out Watchdog

If dial-out is enabled, the DAS will also enable a "dial-out watchdog timer". The "dial-out watchdog timer" will cause the DAS to reboot itself if it has not succeeded in making a dial-out connection at least once in 4 days, to the point of successfully connecting to the PPP server.

This feature is intended to provide extra safety for DAS's installed in remote locations which are not easily serviced, where dial-out may be the only means of communication.
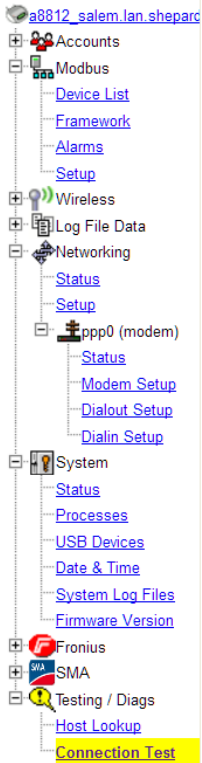
If the DAS goes for 4 days without making a successful PPP connection, it will execute a graceful reboot and will record this event in the system log file.

If the USB modem is accidentally disconnected from the DAS or for any reason cannot be initialized, the DAS will display a status message on its LCD warning of this situation so that it can be corrected. Example:

Test Dial-Out by Running a "Connection Test"

Once you've enabled and configured dial-out, test these settings by running a Connection Test, via the DAS's "Testing / Diags >> Connection Test" web page. The result should look something like this:

```
a8812_salem.lan.shepard
  Accounts
  Modbus
    Device List
    Framework
    Alarms
    Setup
  Wireless
  Log File Data
  Networking
    Status
    Setup
    ppp0 (modem)
      Status
      Modem Setup
      Dialout Setup
      Dialin Setup
  System
    Status
    Processes
    USB Devices
    Date & Time
    System Log Files
    Firmware Version
  Fronius
  SMA
  Testing / Diags
    Host Lookup
    Connection Test
```

Data Upload Diagnostics

```
Checking and tidying-up configuration files...
Ping localhost [127.0.0.1]: Success
Ethernet IP address [10.55.77.127], mask [255.255.0.0]
Local subnet [10.55.0.0] to [10.55.255.255]
Ping ethernet IP address [10.55.77.127]: Success
Starting system debug logger
Dialout enabled, starting dialout process now.
  Expect to find modem of type [Radicom-V92HU-E2] ...
  Probing device connected on [ttyACM0], USB-vendor-ID=0572 USB-product-ID=1329
    24680246 Conexant USB Modem ...
  Found modem [Radicom-V92HU-E2] connected on [ttyACM0], USB-vendor-ID=0572 USB-product-ID=1329
    24680246 Conexant USB Modem
  Modem matches expected modem type. Good.
  Modem port is [ttyACM0]
  Serial connection established.
  local  IP address 10.55.76.8
  remote IP address 10.55.76.2
  primary   DNS address 10.55.78.1
PPPDialoutNow: dialup script complete.  Dialout time: 48 seconds. MyIP=[10.55.76.2]
  Gateway=[0.0.0.0]
Dialup process complete.
Ping PPP IP address [10.55.76.2]: Failure
Ping DNS #1 [67.51.237.194]: Success
Ping DNS #2 [8.8.8.8]: Success
Resolving time server [time.buildingmanageronline.com] to an IP address: Success. Got [67.51.237.194]
Ping time server [time.buildingmanageronline.com]: Success
Testing time server
SyncTime: Sync system time with time.buildingmanageronline.com.
  msntp options: a=2 p=0 v=1 e=0.100 E=5.000 P=2147483647.000
    d=15 c=5 x=0 op=1 l=/etc/msntp.pid f= time.buildingmanageronline.com
  msntp: using NTP server time.buildingmanageronline.com (67.51.237.194)
  msntp: correction 0.007 +/- 0.043+0.140 secs - ignored
  msntp options: a=2 p=0 v=1 e=0.100 E=5.000 P=2147483647.000
    d=15 c=5 x=0 op=1 l=/etc/msntp.pid f= time.buildingmanageronline.com
  msntp: using NTP server time.buildingmanageronline.com (50.43.126.17)
  msntp: correction -0.004 +/- 0.055+0.140 secs - ignored
  System time ==> RTC:  UTC  Thu Nov 10 16:52:40 2011
  Updated hardware RTC.
  new time: Thursday, November 10 2011 08:52:40 PST, drift 21 seconds.
Checking all upload channels.
----- Checking Upload Channel 1's configuration...
```

LCD Messages While Dialing-Out

The AcquiSuite/AcquiLite DAS will display the following messages on its LCD while dialing out. These can be used to diagnose problems if a PC or other full-featured web browser is not available.

Preparing to Dial Out

The DAS is performing housekeeping tasks like compressing log-files. This can take ~30 seconds or more if the DAS's flash-memory is full.
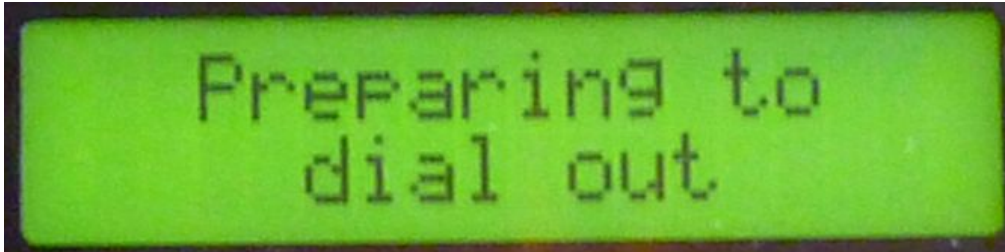
Dialing Out

The DAS is about to dial out.
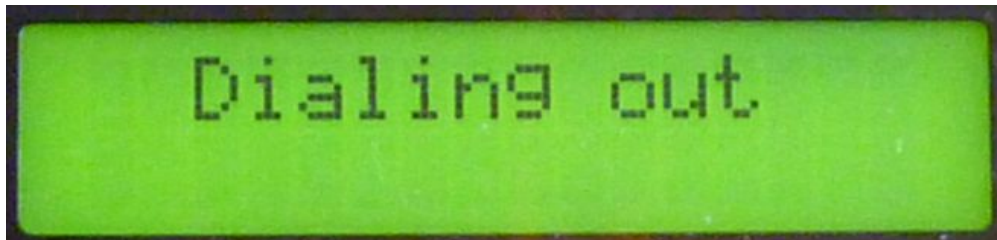
Calling

The DAS displays the number it is dialing. In this case, the number is "*99#", a special number used with T-mobile cellular modems.
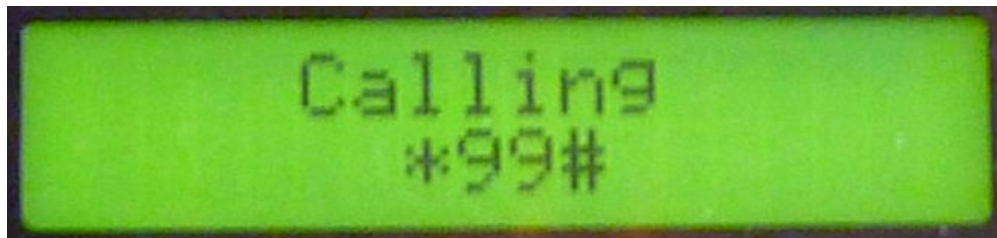
Modem Connecting / Waited N so far

If the call takes longer than 15 seconds to connect, the DAS will remind you that it is still connecting with this message, including the total number of seconds it has waited so far. This message will update every 3 seconds. The DAS waits a total of 90 seconds to connect, then gives up.

Modem Connected

Assuming the modem completes the call, the DAS will display this on its LCD:

Errors connecting are also indicated on the LCD:

Connect failed: Modem Timeout

Connect failed: LINE IN USE

Connect failed: NO LINE or NO CARRIER

The DAS now begins the process of uploading data for each of the enabled upload channels. Example messages are shown below:

Uploading Ch N: / Sending Status

The DAS is sending its status (system health, etc.) to the server configured for upload channel #1:
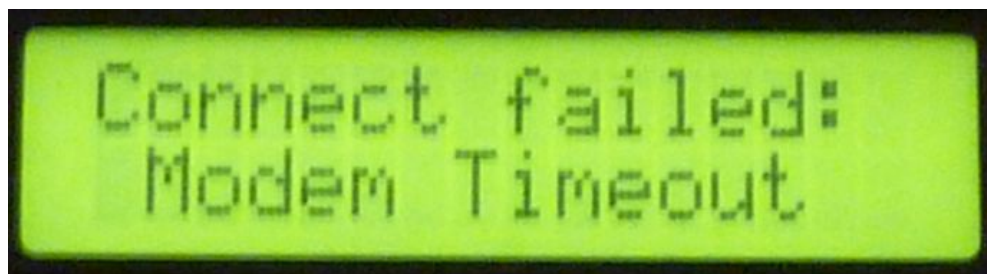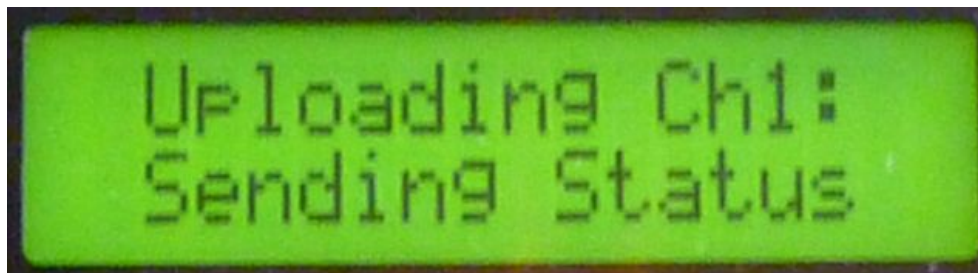

Uploading Ch N: / Sent XX% Data

Next the DAS sends any queued meter data for channel #1, and periodically reports the % of data it has sent so far.

Uploading Ch N: / Sync Config

Finally, the DAS synchronizes its configuration files with the server for channel #1. This process is covered in detail in the AcquiSuite Module Developer's Manual. For now, it is enough to know that the DAS will compare the MD5 signatures of each configuration file against those on the server, and if there are any differences it will either download or upload configuration files depending on whether the local or remote file is newer.
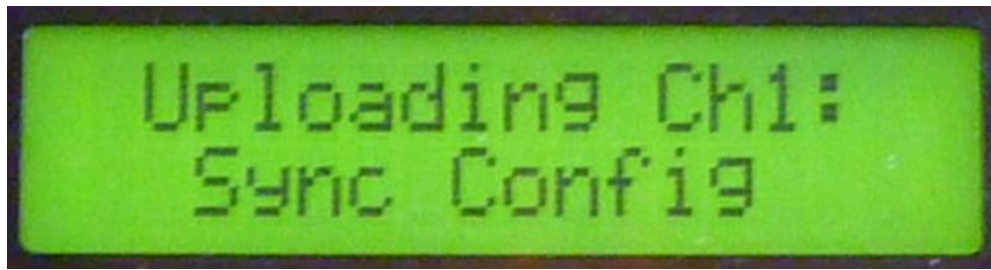
The DAS will then continue on with channels 2 through 4 (if they are enabled):
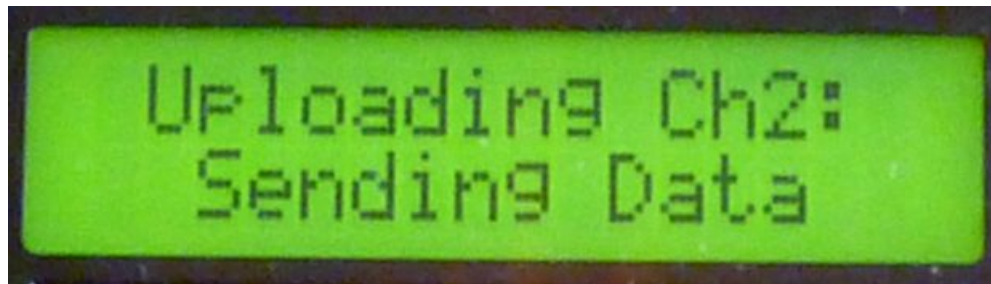
Dialout Success: / Hanging up, Done

If the entire upload cycle completes, the DAS will display the following on its LCD. If the call was dropped for some reason, the DAS will display the particular modem or PPP error.

Upload Results: ALL OK

If all queued meter log files were upload successful on all enabled channels, the DAS will display the following:

Upload Results: X of Y fail

Conversely, if the DAS managed to make a modem connection (the call was answered, and PPP login was completed), but there were some errors during the upload cycle, the DAS will display a message like the following:
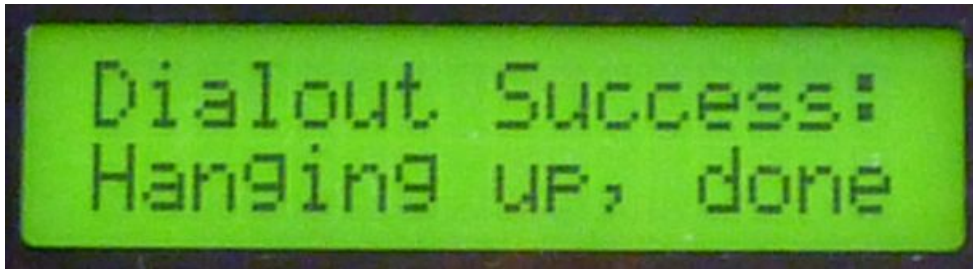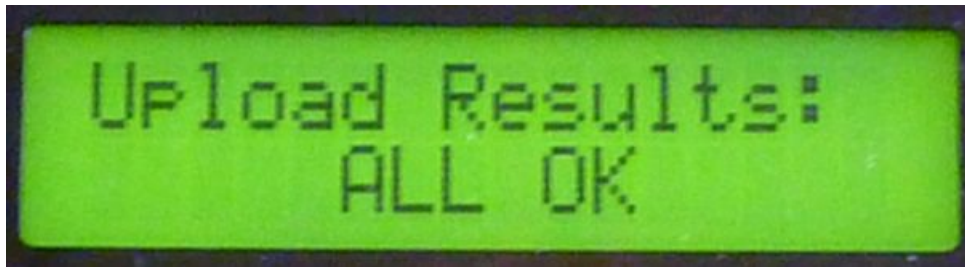
This message shows the total number of meter data files the DAS failed to upload out of the total which were pending at the start of the upload cycle. In this example, 379 data files were pending at the start of the upload cycle, and of these, 324 data files could not be uploaded and remain in the DAS's flash memory for the next upload cycle.
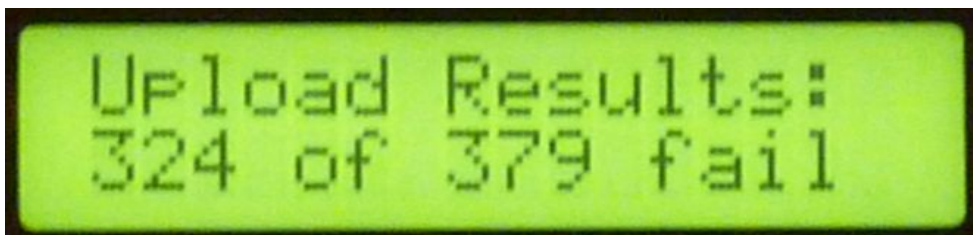
Note: It is normal to experience a <u>small</u> number of <u>temporary</u> upload errors especially over noisy phone lines or cellular modems with poor signal strength. The DAS displays the total number of failures rather than a percentage (%) to let you judge the severity of the problem from the LCD.

Step 4: Enable & Configure Dial-In

"Dial-in" allows the DAS to be remotely administered and allows data to be "pulled" from the DAS using Obvius' EnerTraxDL software.

"Dial-in" is not supported with cellular modems. It is supported with all "POTS" modems, including all USB "POTS" modems.

To enable dial-in, check the "Dialin Enabled" box in the DAS's "Dialin Setup" web page and click Apply. Like so:

Within 10 to 20 seconds, the DAS's LCD should show the message "Ready for Incoming Call", like so:
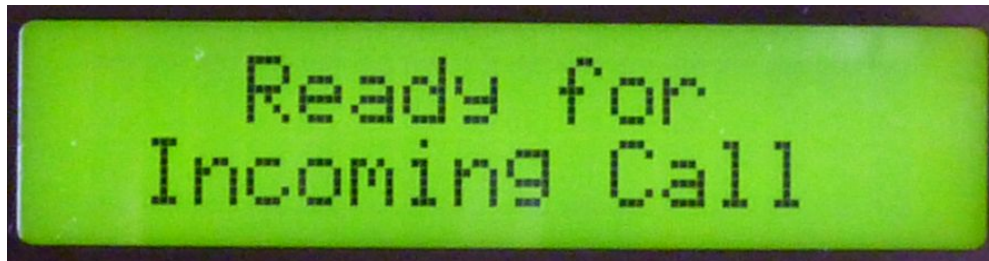
If the DAS encounters problems while preparing the modem to receive incoming calls, it will display messages such as these on the LCD display. These will be updated every few minutes until the problem is corrected or "dial-in" is disabled.
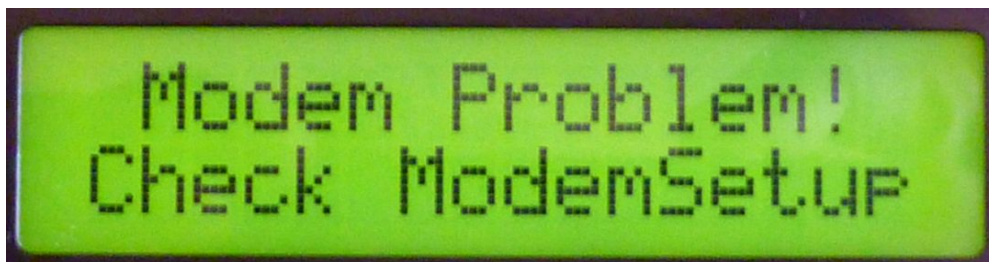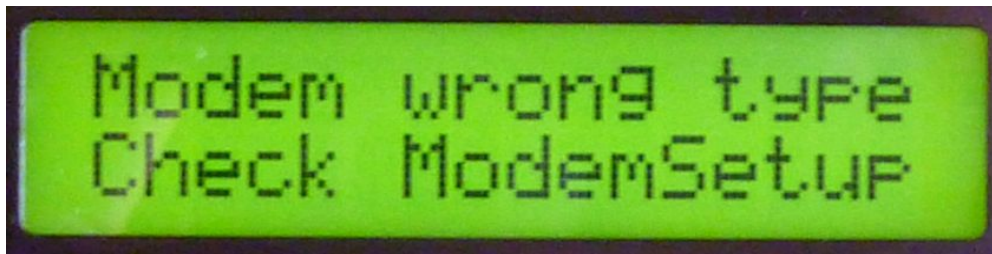
The Dial-In Watchdog

If dial-in is enabled, the DAS will also enable a "dial-in watchdog timer". The "dial-in watchdog timer" will cause the DAS to gracefully reboot itself *if it fails to successfully initialize the modem to receive incoming calls* at least once every 24 hours.

To be clear: The DAS does not need to actually receive a call every 24 hours, it simply needs to communicate with the modem and successfully *prepare* to receive dial-in calls once every 24 hours.

The one exception to this is if the "Remain connected after upload" option is enabled in the "Dialout Setup" page – if the DAS sees that the modem is in-use, it will ignore its "dial-in watchdog timer".

This feature is intended to provide extra safety for DAS's installed in remote locations which are not easily serviced, where dial-in may be the only means of communication.

In normal operation, the "dial-in watchdog timer" should never trigger. The DAS will usually initialize the modem and begin listening for an incoming call within 10 seconds of the modem hanging up from a previous call, and the DAS will reinitialize the modem to receive incoming calls once every hour for safety.

Test Dial-In by Having Someone Call into the DAS

Once "dial-in" is enabled, you should test it by having someone call the AcquiSuite/AcquiLite, connect via PPP and login using one of the 3 standard user accounts:

- admin
- operator
- user

The following messages will be shown on the AcquiSuite/AcquiLite's LCD when a call is received.

LCD Messages while Dialing-In

Ready for Incoming Call

Indicates the DAS has initialized the modem and is ready to answer a call:
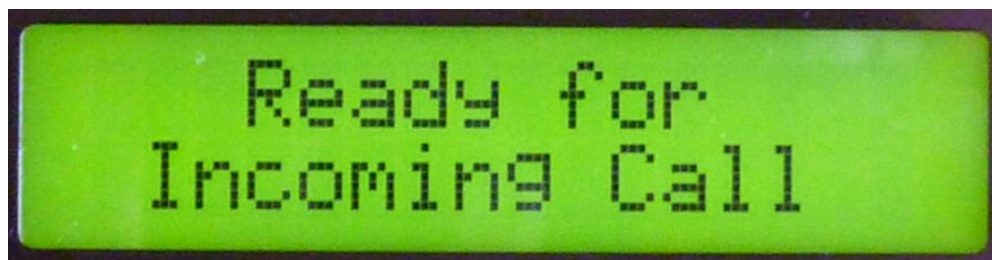
Dial-in: Answering Call

The DAS has detected a "ring" and is attempting to answer the call
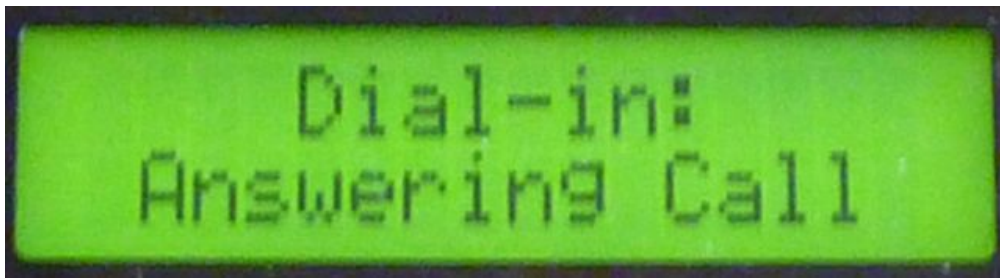
Modem Connected / Receiving PPP

The DAS has answered the call, connected to the remote modem, and is negotiating a PPP connection

Dial-in Failed: Bad PPP User/Password

If the remote system fails to provide the proper username or password, the DAS will report the following on its LCD:
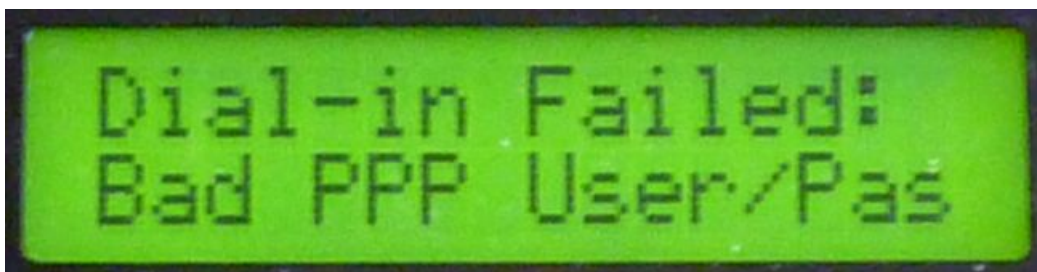
Dial-in OK: Remote hung up!?

The dial-in call ended with the remote end hanging up. This is not an error unless unexpected.

Within 10 to 20 seconds, the DAS will report it is ready to receive another call.

Ready for
Incoming Call

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Detailed Explanation of the "Modem Setup" Options

The "Modem Setup" Web Page

This configuration option will allow you to configure specific features in the modem if needed. For most applications, the default settings are ok. The options are as follows:

Scan for New Modem button: When clicked, the AcquiSuite will begin searching for the best modem to use. It first scans any USB devices and then looks for an onboard modem (on a daughtercard, A8812 only).

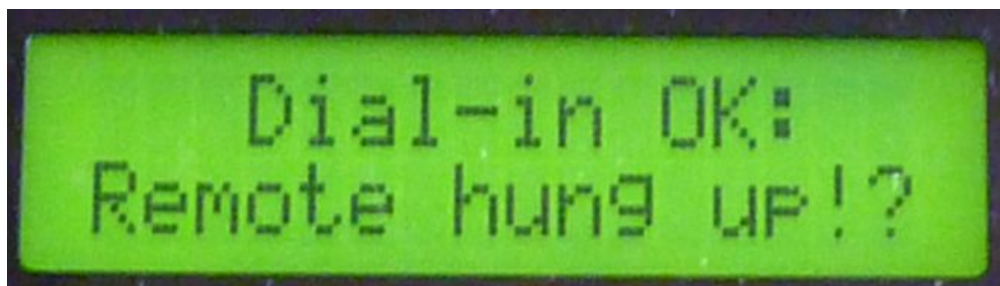While the scan is in progress, a message is displayed. This scan usually takes around 5 seconds but can take up to 60 seconds with certain USB cellular modems because the modem must register itself with the cellular network after being powered on.

Modem type: This shows the type modem detected, or "No-Modem" if none was detected or the modem was not recognized as a supported modem.

Supported Modems

Vendor	Model #	Description
dial-up (POTS) modems		
Multitech	MT3400SMI	dial-up modem, daughtercard, **A8812 only**
Multitech	MT5600SMI	dial-up modem, daughtercard, **A8812 only**
Multitech	MT5656SMI	dial-up modem, daughtercard, **A8812 only**
Multitech	MT5692SMI	dial-up modem, daughtercard, **A8812 only**
U.S.Robotics	USR5637	dial-up modem, USB version
Radicom	V92HU-E2	dial-up modem, USB version
GSM cellular modems		
Multitech	MTSMC-G	GSM cellular modem, daughtercard, **A8812 only**
Multitech	MTCBA-G-U-F4	GSM cellular modem, USB version; *Note: will appear as "MTSMC-G, connected via USB"*

The "Modem Setup" Page -- Options for All Modems

Max serial port speed: This feature allows you to specify the maximum speed at which th modem can communicate at. The default is 115.2kbps. This is useful in diagnosing noisy phone lines, you may be able to get a more reliable connection by slowing down the maximum rate of data transfer.

Setup string: This option allows the use of specialized modem setup strings. The default "AT" is sufficient for most applications.

Modem speaker enabled: This option sets whether the speaker is on or off. The older AcquiSuite A8811-1 (rev C) does not contain a speaker. Newer models manufactured after September 2005 include a modem speaker. (Dialup modems only).

Debug PPP messages: Checking this option will allow the system debug log to show a complete report of the PPP connection status. This will include the PPP session negotiation for an IP address and other connection parameters. You must click the "start log" button on the system/log files page to record this information.

Debug modem chat: Checking this option will record information about the modem setup and call summary. This includes modem line quality and setup parameters. You must click the "start log" button on the system/log files page to record this information.

PPP MTU: MTU, or Maximum Transfer Unit, allows reducing the maximum size of IP packets sent over dialup/PPP connections. This option should only be changed under the direction of Tech Support.

Modem Diagnostics: This button will run a diagnostic test on the modem to verify that it is working and report the modem firmware version number.

The "Modem Setup" Page -- Options for GSM Cellular Modems

GSM band: Lets you select the GSM frequency band.

GSM signal strength: Displays the most recent signal strength reported by the modem.

GSM signal quality: Displays the most recent signal quality reported by the modem.

The "Modem Setup" Page -- Modem Diagnostics

This page displays detailed information about the modem such as its model code, firmware version (for some modems) and supported features. The format varies because the information comes directly from the modem in the vendor's format.

Reset Modem: This button will issue a command to reset the modem.